

# Koch Spiral Modules

## TFC® RO/NF Series

### PRODUCT DESCRIPTION:

**Membrane chemistry:** Proprietary polyamide Thin-Film Composite (TFC®).

**Membrane type:** HR - Reverse Osmosis; SR1 - Nano/Desalination.

**Construction:** Spiral-wound with trimmable net overwrap. Specifically designed to conform to SA, USDA and FDA guidelines.

**Options:** feed channel spacers, N1 (51 mil/1.3 mm) standard, N2 (40 mil/1.2 mm) on selected modules.

### SPECIFICATIONS:

Model	Membrane Type	Nominal Permeate Flow		Nominal Average Chloride Rejection %	Nominal Active Membrane Area	
		gpd	m <sup>3</sup> /d		ft <sup>2</sup>	m <sup>2</sup>
TFC-3038HR-N1	High Rejection	1,300	72	99.0	70	6.5
TFC-5050HR-N1	High Rejection	1,900	72	99.0	75	6.5
TFC-6050HR-N1	High Rejection	2,000	72	99.0	215	20.0
TFC-5050SR1-N1	Selective Rejection	1,500	68	50-55	70	6.5
TFC-5050SR2-N1	Selective Rejection	1,800	68	30-35	75	6.5

Test conditions: HR - 2000 ppm NaCl solution at 225 psi/15.5 bar, 100% recovery, 77°F/25°C and pH 7.5  
SR1 - 5% NaCl/4000 ppm NaCl at 225 psi/15.5 bar, 100% recovery, 77°F/25°C and pH 7.5

### OPERATING AND DESIGN INFORMATION:

Typical operating pressures for the HR module - 400-600 psi/28-41 bar

Typical operating pressures for the SR1 module - 200-500 psi/14-35 bar

Operating temperature range - 40-120°F/5-50°C

Cleaning temperature range - 95-120°F/35-50°C

pH range for continuous operation - 4.0-10.0

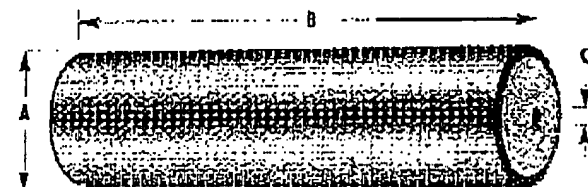
pH range for Clean-In-Place (CIP) - 2.0-11.0

Design pressure drop per element - 10 psi/0.7 bar

Design pressure drop per vessel (5-in-series) - 50 psi/3.5 bar

### PRODUCT DIMENSIONS:

Model	A (diameter)		B (length)		C (F.I.)	
	inches	mm	inches	mm	inches	mm
TFC-3038HR-N1	3.8	96	38.0	965	0.051	1.3
TFC-5050HR-N1	5.0	127	50.0	1270	0.051	1.3
TFC-6050HR-N1	6.0	152	60.0	1525	1.158	29.4
TFC-5050SR1-N1	5.0	127	50.0	1270	0.051	1.3
TFC-5050SR2-N1	5.0	127	50.0	1270	0.051	1.3



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# TFC® FOOD & DAIRY RO/NF MODULES

## Membrane characteristics

- TFC®-HR High Rejection modules provide higher flux and high rejections (typically >99.95% protein and lactose rejection).
- TFC®-SR Selective Rejection modules are selected when desalting and organic concentration is the objective. TFC®-SR will preferentially pass monovalent salts such as sodium chloride yet retain divalent salts, proteins and sugars (such as lactose) with rejections typically >99%.

## Operating limits

- Operating pressure: Maximum operating pressure for HR is 1000 psi/69 bar; maximum operating pressure for SR is 600 psi/41 bar.
- Permeate pressure: Permeate pressure should not exceed baseline (concentrate) pressure at any time (including on-line, off-line and during transition). Reverse pressure will damage the module.
- Differential pressure: The maximum differential pressure per module is 12 psi/0.8 bar. The maximum differential pressure for any length vessel is 60 psi/4.0 bar.
- Temperature: Maximum operating and cleaning temperature is 120°F/50°C.
- pH: Maximum cleaning pH is 11.2. Minimum cleaning pH is 1.8.

## Water Quality for Cleaning and Diafiltration

- Turbidity and SDI: Maximum feed turbidity is 1 NTU. Maximum feed SDI is 5.0 (15-minute test).
- Water Quality Guidelines: Please refer to Koch's Water Quality Guidelines for CIP and Diafiltration for more detailed information.

## Cationic (positively charged) polymers and surfactants and lubricants

- Cationic polymers and surfactants: TFC® membranes may be irreversibly fouled if exposed to cationic (positively charged) polymers or surfactants. Exposure to these chemicals will void the warranty.
- Lubricants: For module installation, use only water or glycerin to lubricate seals. The use of petroleum or vegetable-based oil/solvents may damage the module and void the warranty.

## Chlorine Exposure

- TFC®-HR has a free chlorine tolerance rating of 1000 ppm-hours at 77°F/25°C, pH 8.
- TFC®-SR1 membrane has a free chlorine tolerance rating of 2,000 ppm-hours at 77°F/25°C, pH 8.
- The maximum continuous chlorine exposure limit is 0.1 ppm.
- Sodium metabisulfite (without catalysts such as cobalt) is the preferred chemical to eliminate free chlorine or similar oxidizers in the feed.
- Chlorine tolerance for TFC® membranes may be significantly reduced if catalyzing metals such as iron are present or if the feed pH and/or temperature conditions are different than stated.
- Refer to RO/NF Cleaning Procedures for sanitization instructions.

## Supplemental Technical Bulletins

- RO/NF Module Cleaning Procedures
- UF Module Cleaning Procedures
- Water Quality Guidelines for CIP and Diafiltration

## Koch's Capability

Koch Membrane Systems is the leader in crossflow membrane technology, manufacturing microfiltration, ultrafiltration, nanofiltration, and reverse osmosis membranes and membrane systems. The industries we serve include food, dairy and beverage, electronics, transportation, chemical, municipal and general manufacturing. Koch adds value by providing quality membrane products and by sharing our experience in the design and supply of thousands of membrane filtration systems worldwide.

## Service and Ongoing Technical Support

Koch has an experienced staff of professionals available to assist endusers and OEM's for optimization of existing systems and support with the development of new applications. We have an ongoing R&D program evaluating unique membranes and components to ensure the availability of state-of-the-art products. Whenever you need our help, it's just a phone call away at 800-345-0499 (U.S.) or 978-657-4250. Koch's Process Technology and Technical Service Departments will provide you with knowledgeable technical assistance whether its staff training, a thorough review of system operation, or recommendations for fine tuning your system.

## Koch Membrane Systems, Inc.

US Headquarters

850 Main Street, Wilmington, MA 01887-3388

TEL 978-657-4250 800-345-0499 (In USA)

FAX 978-657-5208

Visit our website

[www.kochmembrane.com](http://www.kochmembrane.com)

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# Membranes for Food Use

Membrane Type	Molecular Weight Cut-Off				Configuration
	1,000	10,000	100,000	1,000,000	
TEC-BO	■				Spiral
TFC-S	■				Spiral
TFC-SR 1	■				Spiral
TFC-SR 2	■				Spiral
MPW-34	■				Spiral/Tubular
MPW-36	■				Spiral/Tubular
HEK-328		■			Spiral
HEK-131		■			Spiral
HFM-116/100			■		Spiral/Tubular
HFM-180			■		Spiral/Tubular
MFK-618				■	Spiral
MFK-601				■	Spiral
MFK-617				■	Tubular
PM-10		■			Hollow Fiber
PM-50			■		Hollow Fiber
PM-100				■	Hollow Fiber
PM-500				■	Hollow Fiber

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**Date:** 7/8/2002  
**Contact:** Mary Beth Jarvis  
316-828-3756  
[jarvism@kochind.com](mailto:jarvism@kochind.com)

**Koch Membrane Systems Introduces the SR2 Nanofiltration Membrane**  
*Selective Rejection Membrane Expands Fluid Systems Product Range*

WILMINGTON, Mass. -- Koch Membrane Systems, Inc. (KMS), the world leader in membrane separation technology, has extended its range of selective rejection nanofiltration (NF) membranes for water and wastewater treatment, with the launch of its new Fluid Systems™ TFC®-SR2™ element.

"The Fluid Systems™ SR2™ features groundbreaking characteristics of very low pressure, high specific flux membranes ideal for efficiently removing divalent ions such as hardness and sulphate, and dissolved organics from municipal drinking water or industrial wastewater streams," said Alan Franks, senior development engineer for KMS. "Hardness rejection is typically 97 percent and organic rejection over 90 percent for organics with molecular weight in the range of 300 daltons."

Operating at extremely low pressures, typically 50 psi (3 Bar), the membrane is very energy efficient and capable of producing more water per square meter (m2) of membrane surface area than competitive products, Franks said. It is ideal for municipal and industrial, for example, treating large volumes of drinking water in municipal plants to remove dissolved organics and hardness.

The Fluid Systems™ TFC®-SR2™ membranes are available in 4-inch and 8-inch diameters and in standard 40-inch or Magnum® 60-inch lengths.

Franks said the latest innovation, one of several new and improved RO/NF membrane products, maintains KMS' reputation as the world leader in membrane separation technology.

More information is available at [www.kochmembrane.com](http://www.kochmembrane.com). Customers can reach company representatives at either of the following offices:

Corporate Headquarters, 850 Main St., Wilmington, Mass. 01887, Phone (800) 343-0499 or Fax (978) 657-5208. OR Fluid Systems RO/NF Sales Office, 10054 Old Grove Road, San Diego, Calif., 92131, Phone (800) 525-4369; Fax (619) 695-2176.

"TFC", "SR2" and "Fluid Systems" are Trademarks of Koch Membrane Systems, Inc. Koch Membrane Systems, a world leader in membrane separation products, acquired Fluid Systems Corporation in 1998. Today the Fluid Systems™ brand remains at the forefront of leading-edge membrane technology. The company, headquartered in Wilmington, is a subsidiary of Koch Chemical Technology Group, LLC.

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# Koch Spiral Modules

## TFC® RO/NF Series

### PRODUCT DESCRIPTION:

**Membrane chemistry:** Proprietary polyamide Tri-Fluor-Composite (TFC®)

**Membrane type:** HR - Reverse Osmosis; SR1 - Nanofiltration

**Construction:** Spiral-wound with removable net outerwrap. Specifically designed to conform to EPA, USDA and FDA guidelines.

**Options:** keon channel spacers, N1 501 mil/12.7mm standard, N2 44 mil 1.2 channel selective modules

### SPECIFICATIONS:

Model	Membrane Type	Nominal Permeate Flow		Nominal Average Chloride Rejection %	Nominal Active Membrane Area	
		gpd	m <sup>3</sup> /d		ft <sup>2</sup>	m <sup>2</sup>
TFC-3038HR-N1	High Rejection	1,900	72	99.0	70	6.5
TFC-3038HR-N1	High Rejection	1,900	72	99.0	70	6.5
TFC-6038HR-N1	High Rejection	6,000	227	99.0	215	20.0
TFC-3038SR1-N1	Selective Rejection	1,500	68	90-95	70	6.5
TFC-6038SR1-N1	Selective Rejection	1,600	68	90-95	70	6.5

*Test conditions: HR - 2000 ppm/total solute at 2.25 psi/15.5 bar, 10% recovery, 75°F/23°C and pH 7.5  
SR1 - 5% NaCl at 2.25 psi/15.5 bar, 10% recovery, 75°F/23°C and pH 7.5*

### OPERATING AND DESIGN INFORMATION:

Typical operating pressures for the HR module - 400-600 psi/28-41 bar

Typical operating pressures for the SR1 module - 200-500 psi/14-35 bar

Operating temperature range - 40-120°F/5-50°C

Cleaning temperature range - 95-120°F/35-50°C

pH range for continuous operation - 4.0-10.0

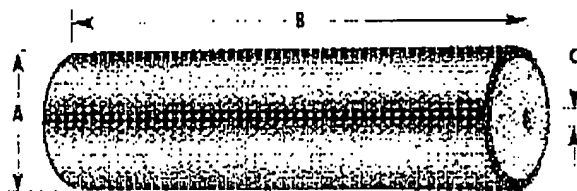
pH range for Clean-In-Place (CIP) - 2.0-11.0

Design pressure drop per element - 10 psi/0.7 bar

Design pressure drop per vessel (5-in-series) - 50 psi/3.5 bar

### PRODUCT DIMENSIONS:

Model	A (diameter)		B (length)		C (d.d.)	
	inches	mm	inches	mm	inches	mm
TFC-3038HR-N1	3.8	96	23.1	591	0.871	21.1
TFC-3038HR-N1	3.8	96	23.1	591	0.871	21.1
TFC-6038HR-N1	6.0	152	23.1	591	1.176	29.9
TFC-3038SR1-N1	3.8	96	23.1	591	0.871	21.1
TFC-6038SR1-N1	6.0	152	23.1	591	0.871	21.1



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## Operating limits

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- ◆ Permeate pressure: Permeate pressure should not exceed baseline (concentrate) pressure at any time (including on-line, off-line and during transition). Reverse pressure will damage the module.
- ◆ Differential pressure: The maximum differential pressure per module is 12 psi/0.8 bar. The maximum differential pressure for any length vessel is 60 psi/4.0 bar.
- ◆ Temperature: Maximum operating and cleaning temperature is 120°F/50°C.
- ◆ pH: Maximum cleaning pH is 11.2. Minimum cleaning pH is 1.8.

## Water Quality for Cleaning and Diafiltration

- ◆ Turbidity and SDI: Maximum feed turbidity is 1 NTU. Maximum feed SDI is 5.0 (15-minute test).
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- ◆ Cationic polymers and surfactants: TFC® membranes may be irreversibly fouled if exposed to cationic (positively charged) polymers or surfactants. Exposure to these chemicals will void the warranty.
- ◆ Lubricants: For module installation, use only water or glycerin to lubricate seals. The use of petroleum or vegetable-based oil/solvents may damage the module and void the warranty.

## Chlorine Exposure

- ◆ TFC®-HR has a free chlorine tolerance rating of 1000 ppm-hours at 77°F/25°C, pH 8.
- ◆ TFC®-SR1 membrane has a free chlorine tolerance rating of 2,000 ppm-hours at 77°F/25°C, pH 8.
- ◆ The maximum continuous chlorine exposure limit is 0.1 ppm.
- ◆ Sodium metabisulfite (without catalysts such as cobalt) is the preferred chemical to eliminate free chlorine or similar oxidizers in the feed.
- ◆ Chlorine tolerance for TFC® membranes may be significantly reduced if catalyzing metals such as iron are present or if the feed pH and/or temperature conditions are different than stated.
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850 Main Street, Wilmington, MA 01887-3588  
TEL 978-657-4250 800-343-0499 [In USA]  
FAX 978-657-5208

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# Membranes for Food Use

Membrane Type	Molecular Weight Cut-Off				Configuration
	1,000	10,000	100,000	1,000,000	
TEC-R0	■				Spiral
TFC-S	■				Spiral
TFC-SR1	■				Spiral
TFC-SR2	■				Spiral
MPW-34	■				Spiral/Tubular
MPW-36	■				Spiral/Tubular
HFK-328		■			Spiral
HFK-131		■			Spiral
HFM-116/100			■		Spiral/Tubular
HFM-180			■		Spiral/Tubular
MFK-618				■	Spiral
MFK-601				■	Spiral
MFK-617				■	Tubular
PM-10		■			Hollow Fiber
PM-50			■		Hollow Fiber
PM-100			■		Hollow Fiber
PM-500				■	Hollow Fiber

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**Date:** 7/8/2002

**Contact:** Mary Beth Jarvis  
316-828-3756  
[j Jarvism@kochind.com](mailto:j Jarvism@kochind.com)

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"The Fluid Systems™ SR2™ features groundbreaking characteristics of very low pressure, high specific flux membranes ideal for efficiently removing divalent ions such as hardness and sulphate, and dissolved organics from municipal drinking water or industrial wastewater streams," said Alan Franks, senior development engineer for KMS. "Hardness rejection is typically 97 percent and organic rejection over 90 percent for organics with molecular weight in the range of 300 daltons."

Operating at extremely low pressures, typically 50 psi (3 Bar), the membrane is very energy efficient and capable of producing more water per square meter (m2) of membrane surface area than competitive products, Franks said. It is ideal for municipal and industrial, for example, treating large volumes of drinking water in municipal plants to remove dissolved organics and hardness.

The Fluid Systems™TFC®-SR2™membranes are available in 4-inch and 8-inch diameters and in standard 40-inch or Magnum® 60-inch lengths.

Franks said the latest innovation, one of several new and improved RO/NF membrane products, maintains KMS' reputation as the world leader in membrane separation technology.

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